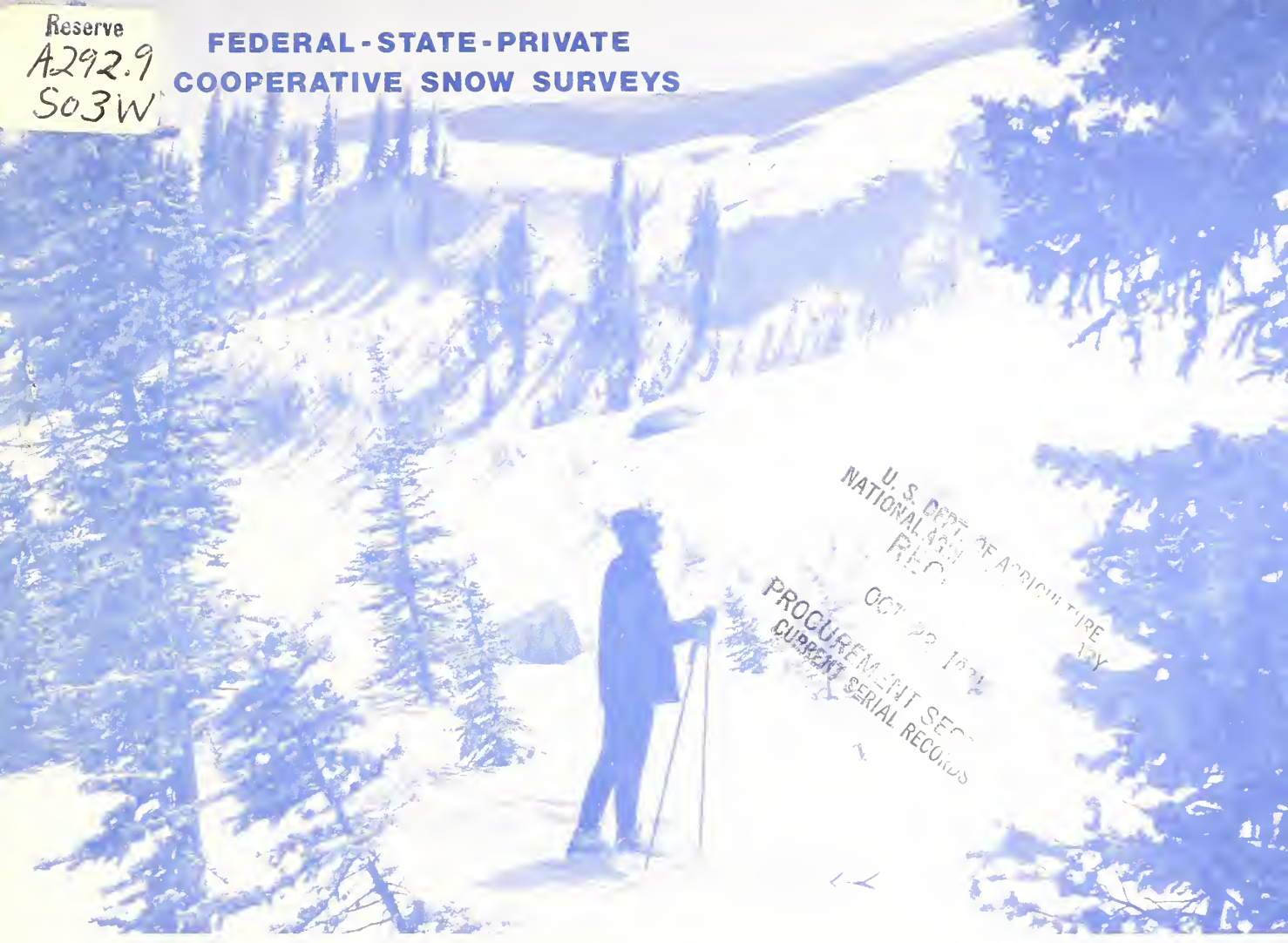
FEDERAL-STATE-PRIVATE
COOPERATIVE SNOW SURVEYS



WATER SUPPLY OUTLOOK FOR WESTERN UNITED STATES

Including Columbia River Drainage in Canada

Prepared by

U. S. DEPARTMENT of AGRICULTURE ★ SOIL CONSERVATION SERVICE

Collaborating with
CALIFORNIA DEPARTMENT of WATER RESOURCES
and
BRITISH COLUMBIA DEPARTMENT of
LANDS, FORESTS and WATER RESOURCES

AS OF
MAY 1, 1971

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Mast of the usable water in western states originates as mountain snawfall. This snowfall accumulates during the winter and spring, several manths befare the snaw melts and appears as streamflaw. Since the runaff fram precipitatian as snaw is delayed, estimates af snawmelt runaff can be made well in advance af its accurrence. Streamflaw forecasts published in this repart are based principally an measurement af the water equivalent af the mauntain snawpack.

Farecasts became mare accurate as mare af the data affecting runoff are measured. All farecasts assume that climatic factors during the remainder af the snaw accumulation and melt seasan will interact with a resultant average effect an runaff. Early season farecasts are therefare subject ta a greater change than thase made on later dates.

The snow course measurement is abtained by sampling snaw depth and water equivalent ot surveyed and marked lacations in mountain areos. A totol of obaut ten samples are taken at each lacatian. The averoge af these are reparted as snaw depth and water equivalent. These measurements are repeated in the same lacatian near the same dates each year.

Snaw surveys are made manthly ar semi-manthly fram January 1 thraugh June 1 in mast states. There are abaut 1900 snaw caurses in Western United States and in the Calumbis Basin in British Calumbia. Netwarks af autamatic snaw water equivalent and related data sensing devices, along with radia telemetry are expanding and will pravide a cantinuaus record af snaw water ond ather parameters af key lacatians.

Detailed data an snow course and sail maisture measurements are presented in state and lacal reparts. Other data an reservair starage, summaries of precipitation, current streamflow, and sail maisture canditians at valley elevatians are alsa included. The repart for Western United States presents a braad picture of water supply outlaok conditians, including selected streamflow farecasts, summary af snaw accumulation ta date, and staroge in larger reservairs.

Snow survey and sail maisture data for the periad of record are published by the Sail Conservatian Service by states abaut every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 af each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservatian Service publishes reparts fallawing the principal snow survey dates fram Jonuary 1 through June 1 in coaperotion with state water administrators, agricultural experiment statians and athers. Capies of the reparts for Western United States and oll state reparts may be abtained from Sail Canservatian Service, Western Regianal Technical Service Center, Raam 209, 701 N. W. Glisan, Partland, Oregon 97209.

Capies af state and local reports may alsa be abtoined from state affices of the Sail Canservation Service in the fallowing states:

STATE	ADDRESS
Alaska	P. O. Bax "F", Polmer, Alaska 99645
Arizana	6029 Federal Building, Phoenix, Arizana 85025
Colorada (N. Mex.)	12417 Federal Building, Denver, Colarada 80202
Idaha	Raam 345, 304 N. 8th. St., Baise, Idaha 83702
Mantana	P. O. Bax 970, Bazeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevado 89505
Oregan	1218 S. W. Washington St., Partland, Oregon 97205
Utah	4012 Federal Bldg., 125 Sauth State St., Salt Lake City, Utah 84111
Washingtan	360 U.S. Caurt Hause, Spakane, Washingtan 99201
Wyoming	P. O. Bax 2440, Casper, Wyaming 82601

PUBLISHED BY OTHER AGENCIES

Water Supply Outlaok reparts prepared by ather agencies include o repart for Califarnia by the Water Supply Farecast and Snaw Surveys Unit, Califarnia Department of Water Resources, P. O. Bax 388, Sacramenta, Califarnia 95802 --- and far British Columbia by the Department af Lands, Farests and Water Resources, Water Resources Service, Parliament Building, Victaria, British Columbia

USDA-SCS-PORTLAND, OREG. 1970

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ISSUED

MAY 1, 1971

The Soil Conservation Service coordinates snow surveys conducted by its staff and many cooperators, including the Bureau of Reclamation, Corps of Engineers, Forest Service, National Park Service, Weather Bureau, Geological Survey, and other Federal Agencies, Departments of State Government, Irrigation Districts, Power Companies, and others.

The Department of Water Resources coordinates snow surveys in California.

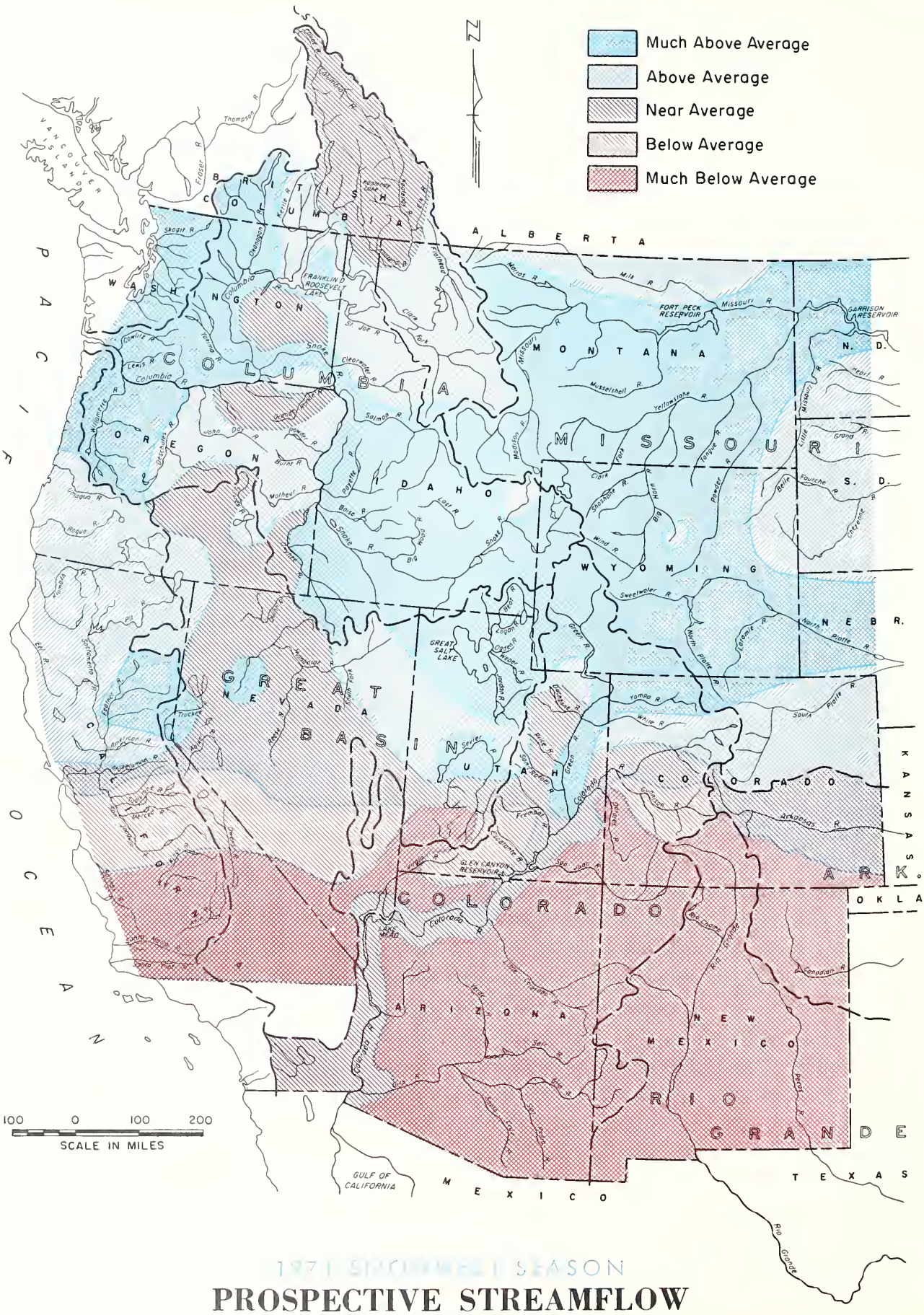
The Water Resources Service, Department of Lands, Forests, and Water Resources directs snow surveys in British Columbia.

This report was prepared by the Water Supply Forecasting Branch, Engineering Division, Soil Conservation Service, from data supplied by Snow Survey Supervisors of the Soil Conservation Service in the States of Alaska, Arizona, Colorado and New Mexico, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Data from California was supplied by the Chief, Water Supply Forecast and Snow Survey Unit, Department of Water Resources.

Data from British Columbia was supplied by the Chief, Hydrology Division, Water Investigations Branch, Department of Lands, Forests and Water Resources.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
KENNETH E. GRANT, ADMINISTRATOR



1971 SPRING SEASON

PROSPECTIVE STREAMFLOW

AS OF May 1, 1971

WATER SUPPLY OUTLOOK

1971 SNOWMELT SEASON
MAY 1, 1971

SHORTAGES ANTICIPATED FOR WATER USERS ON NATURAL FLOW RIGHTS IN ARIZONA, NEW MEXICO AND LIMITED AREAS IN SOUTHERN SECTIONS OF COLORADO, UTAH AND CALIFORNIA. STORAGE IN MAJOR RESERVOIRS OF THESE AREAS IS BELOW AVERAGE, BUT ADEQUATE FOR MOST USES. NEAR OR CONSIDERABLY ABOVE AVERAGE STREAMFLOW, COMBINED WITH EXCELLENT RESERVOIR STORAGE, ASSURES EXCEPTIONALLY GOOD WATER FOR REMAINING WESTERN AREAS. HIGH WATER PROBLEMS POSSIBLE, PARTICULARLY IN WYOMING, MONTANA, SOUTHERN IDAHO, ALONG THE CASCADE MOUNTAINS OF WASHINGTON AND OREGON, AND IN PARTS OF ALASKA.

Snow and rainfall during April were generally near or below average in northern areas of the west, but essentially non-existent in southern areas. Snowmelt proceeded rather rapidly in southern sections, leaving many watersheds with little or no snow. In northern areas the valley and foothill snows were removed, but intermediate and high elevation snowpacks generally remained dense and well above normal. Very little melt occurred at the higher elevations. April snowfall was very heavy in Wyoming, adding to the already record or near record high snowpack.

Weather during April and early May in northern areas has been favorable for removing low elevation snowpacks in an orderly manner. If the alternate warm and cool spells continue thru the spring months, high water problems from the major snowpack will be held to a minimum. However, if the weather turns warm, and particularly if it is accompanied by warm rains, high water damage could become severe in areas not protected by reservoirs having adequate flood control space.

The California Department of Water Resources reports that prospective snowmelt runoff during 1971 ranges from above normal in the northern portion of the State to well below normal in the southern San Joaquin Valley. Although April runoff was below normal, except in the northernmost part of the State, reservoir storage is normal or above.

The upper Columbia and Kootenay rivers in British Columbia have snowpacks which are near 10 to 30 percent above average, according to the British Columbia Water Resources Service, Department of Lands, Forests and Water Resources. Because soil moisture underlying the snowpack is below normal, however, prospective runoff is reduced to about 5 to 10 percent above average.

Record or near record high snowpacks (150 to 200 percent normal) lie on most watersheds of Wyoming, Montana, central and southern Idaho, and along the Cascade Mountains of Washington and Oregon. The snow is also very heavy along Colorado's part of the North Platte, on the Yampa and Little Snake rivers, along the Bear River tributaries of Utah, Idaho and Wyoming, and on the Lake Tahoe-Truckee River watersheds of the Nevada-California border.

Snowmelt runoff from streams in these heavy snowpack areas will generally range from near 135 to over 200 percent of their usual amounts. Some of these streams are expected to yield volumes of water which will be near or above the maximum recorded in the past 30 to 50 years. Typical of some of the higher forecasts are the North Platte at Saratoga, Wyoming (185 percent), Green River inflow to Flaming Gorge Reservoir, Utah (191 percent), Jefferson River at Sappington, Montana (164 percent), Bear at Harer, Idaho (212 percent), Big Wood River inflow to Magic Reservoir, Idaho (174 percent), Truckee River at Farad, California (161 percent) and Lewis River at Ariel, Washington (146 percent).

In Alaska, snowmelt runoff of the Chena and Salcha rivers is forecast at 174 and 67 percent of normal, respectively.

Streamflow prospects are much less favorable in Arizona and New Mexico where the snow cover is gone and most streams are already dropping to base flow values.

SUMMARY OF SNOW WATER EQUIVALENT MEASUREMENTS

May 1, 1971

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
MISSOURI BASIN		
Jefferson	112	148
Madison	104	150
Gallatin	94	149
Missouri Main Stem	89	135
Yellowstone	110	155
Shoshone	102	183
Wind	155	175
North Platte	110	160
South Platte	80	135
ARKANSAS BASIN		
Arkansas	57	95
Cucharas-Purgatoire	0	0
RIO GRANDE BASIN		
Rio Grande (Colo.)	60	61
Rio Grande abv. Otowi Bridge	57	59
Pecos	0	0
COLORADO BASIN		
Green (Wyo.)	155	185
Yampa - White	83	136
Duchesne	89	94
Price	59	89
Upper Colorado	75	122
Gunnison	64	90
San Juan	56	52
Dolores	30	52
Virgin	55	54
Gila	0	0
Salt	0	0
GREAT BASIN		
Bear	126	170
Logan	135	179
Ogden	109	141
Weber	84	116
Provo - Utah Lake	60	83
Jordan	76	114
Sevier	58	78
Walker - Carson	119	125
Tahoe - Truckee	166	178
Humboldt	75	105
Lake Co. (Oregon)	135	125
Harney Basin (Oregon)	72	164
UPPER COLUMBIA BASIN		
Columbia (Canada)	147	115
Kootenai	165	130
Clark Fork	105	128
Bitterroot	114	131
Flathead	96	114
Spokane	106	115
Okanogan	132	142
Methow	132	160
Chelan	166	133
Wenatchee	165	186

MAJOR BASIN AND SUB—WATERSHED	WATER EQUIVALENT IN PERCENT OF: LAST YEAR	AVERAGE
SNAKE BASIN		
Snake above Jackson, Wyo.	115	150
Snake above Hiese, Idaho	135	185
Snake abv. American Falls Res.	123	170
Henry's Fork	124	175
Southern Idaho Tributaries	101	160
Big and Little Wood	118	145
Boise	120	155
Owyhee	25	75
Payette	118	167
Malheur	90	195
Weiser	142	175
Burnt	80	170
Powder	95	155
Salmon	111	140
Grande Ronde	95	130
Clearwater	114	125
LOWER COLUMBIA BASIN		
Yakima	156	180
Umatilla	65	125
John Day	75	150
Deschutes - Crooked	170	155
Hood	185	185
Willamette	265	195
Lewis	186	182
Cowlitz	130	167
PACIFIC COASTAL BASIN		
Puget Sound	168	154
Olympic Peninsula	192	154
Umpqua - Rogue	255	190
Klamath	240	160
Trinity	195	165
CALIFORNIA CENTRAL VALLEY		
Upper Sacramento	160	160
Feather	225	170
Yuba	245	185
American	170	135
Mokelumne	140	110
Stanislaus	130	105
Tuolumne	110	95
Merced	105	90
San Joaquin	110	90
Kings	115	85
Kaweah	120	80
Tule	165	50
Kern	145	65

Data for California Watersheds supplied by Dept. of Water Resources, and for British Columbia Watersheds by Dept. of Lands, Forests and Water Resources.

Average is for 1953-67 period. California averages are for the period 1931-70.
Based on Selected Snow Courses determined by Distribution within the Basin, Length of Record and Repetitive Monthly Measurement Schedules.

Total snowmelt runoff in Arizona will be near 20 percent of average. Reservoir storage for Arizona's Salt River project will be adequate to make up its deficit, but water users on the Gila River and on the San Carlos project will be very short of water.

In New Mexico and southern Colorado the Rio Grande, San Juan, Dolores, Pecos, Canadian and southern tributaries to the Arkansas River will generally yield near one-half or less of their usual flows. Reservoir storage is generally below average, but will be helpful. Natural flow rights will suffer serious shortages. Careful conservation of water supplies will be needed.

Water supply for the main Arkansas and upper Colorado rivers in Colorado will be average. Flow of Colorado's Gunnison River, as well as smaller streams in extreme southern Utah will be somewhat below average. Reservoir storage in Colorado and Utah is exceptionally favorable and will offset low runoff prospects except for those users without reservoir rights.

Inflow to Lake Powell on the Colorado River is forecast at 119 percent, making prospects for water and power very good.

In Nevada, major streams other than the Truckee are forecast to yield near or above average runoff. This, combined with excellent reservoir storage, assures good to excellent water supplies.

With the exception of southwestern states, water stored for irrigation purposes continues near or well above average. Storage space reserved for flood control operations has been sharply drawn down to provide room for expected high runoff in many of the high snowpack areas.

MISSOURI BASIN

The snowpack is heavy in southwestern Montana. Some snowmelt was noted at higher elevations during April, but a few courses still have a maximum water content of record. In the Missouri headwaters area, the snowpack is about 50 percent above average. Snow is lighter near the Canadian border where runoff of the Milk River is forecast at 93 percent of average.

On the Yellowstone River the snow is still a maximum of record at a few of the higher elevation courses. While snowmelt during the month was noted at lower elevation sites, the snowpack here is still half again as much as usual. In the Big Horn Mountains the snow is a third above average.

The snow is much heavier, at or near record breaking levels, on Wyoming's Shoshone, Wind and North Platte rivers. Snow on the Shoshone and Wind rivers is near 80 percent above average, and 60 percent above on the North Platte. April snowfall contributed to the build-up of the pack, particularly on the Wind River range where readings are at record amounts. In Colorado the snow continues at near record amounts on the North Platte, but falls off to only a third above average on the South Platte.

Heaviest streamflow percentagewise is expected from the Belt River, forecast at 177 percent. With the exception of the Milk River noted above, forecasts for other Montana streams range from about 135 to 165 percent of average. Some of these forecasts represent volumes near or above the maximum recorded in the past 30 to 35 years.

Flow of the main stem of the Missouri will be near 155 to 160 percent at Landusky, Montana and Williston, North Dakota. The Yellowstone River will yield near 135 percent into Yellowstone Lake and about 156 percent at Miles City. In Wyoming the Wind at Riverton is forecast at 156 percent, while flow of the Big Horn at St. Xavier is expected to be 163 percent.

Typical of expected flows on the North Platte River system are forecasts for the Laramie near Jelm (159 percent), Encampment near Encampment (171 percent) and the North Platte at Saratoga (185 percent). Forecasts for the South Platte are lower and range from about 15 to 35 percent above the usual amount.

ARKANSAS BASIN

Near normal water supplies are expected this summer along the main Arkansas River. However, the outlook is not so favorable along the smaller tributaries on the south side of the basin. The snowpack on the upper Arkansas is within 5 percent of average, but has disappeared from the Cucharas-Purgatoire drainages.

The Arkansas River is now forecast to yield 97 percent of average at Salida. Last winter's light snow on the southern tributaries is reflected by streamflow forecasts of 42 percent average on the Cucharas near LaVeta and 54 percent on the Purgatoire at Trinidad. John Martin Reservoir is essentially empty, holding only 5 percent of the average amount.

The Canadian drainage is not highly affected by snow, but very little snowmelt runoff

SELECTED STREAMFLOW FORECASTS May 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow In (1,000 A.F.)
	Flow In (1,000 A.F.)	Percent of Average		
UPPER MISSOURI				
Jefferson at Sappington, Montana	1,340	164	May-Sept	
Madison near Grayling, Montana 1/	555	147	May-Sept	481
Gallatin near Gateway, Montana	665	151	May-Sept	641
Sun at Gibson Dam, Montana 3/	770	134	May-Sept	544
Belt near Monarch, Montana	182	177	May-Sept	217
Marias near Shelby, Montana 4/	710	134	May-Sept	
Missouri near Lundusky, Montana 2/	6,100	154	May-Sept	
S. F. Musselshell above Martinsdale, Montana	63	150	May-Sept	76
Milk near Eastern Crossing, Montana	205	93	May-Sept	
Yellowstone at Yellowstone Lake Outlet, Wyo.	1,130	135	April-Oct	
Yellowstone at Corwin Springs, Montana	2,640	146	May-Sept	2,104
Clark Fork at Belfry, Montana	800	142	May-Sept	653
Shoshone, Inflow to Buffalo Bill Res., Wyo.	1,150	142	April-Sept	
Wind at Dubois, Wyoming	150	151	April-Sept	
Wind at Riverton, Wyoming	1,015	156	April-Sept	
Bull Lake near Lenore, Wyoming	235	132	April-Sept	
Tensleep near Tensleep, Wyoming	82	111	April-Sept	
Medicine Lodge near Hyattville, Wyoming	25	126	April-Sept	
Shell Creek near Shell, Wyoming	85	129	April-Sept	
Big Horn at St. Xavier	2,600	163	May-Sept	
Tongue near Dayton, Wyoming	140	136	April-Sept	
Yellowstone at Miles City, Montana 5/	8,500	156	May-Sept	
Missouri near Williston, N. Dak. 6/	15,200	158	May-Sept	
PLATTE				
North Platte at Saratoga, Wyoming	1,030	185	April-Sept	
Encampment near Encampment	217	171	April-Sept	
Laramie near Jelm, Wyoming 7/	165	159	April-Sept	
Big Thompson at Drake, Colorado	117	117	April-Sept	
Clear at Golden, Colorado	155	130	April-Sept	
St. Vrain at Lyons, Colorado	95	136	April-Sept	
Cache LaPoudre near Fort Collins, Colorado 8/	250	116	April-Sept	
ARKANSAS				
Arkansas at Salida, Colorado 9/	300	97	April-Sept	
Cucharas near LaVeta, Colorado	5	42	April-Sept	
Purgatoire at Trinidad, Colorado	25	54	April-Sept	
RIO GRANDE				
Rio Grande near Del Norte, Colorado 10/	270	62	April-Sept	
Conejos near Mogote, Colorado 11/	110	60	April-Sept	
El Vado Res., Inflow, New Mexico	100	53	March-July	
Rio Grande at Otowi Bridge, New Mexico 12/	240	47	March-July	
Pecos at Pecos, New Mexico	20	49	March-July	
UPPER COLORADO				
Granby Reservoir Inflow, Colorado 13/	275	126	April-Sept	
Colorado at Dotsero, Colorado 14/	1,600	116	April-Sept	
Roaring Fork at Glenwood Springs, Colorado 15/	730	105	April-Sept	
Colorado near Cameo, Colorado 16/	2,480	112	April-Sept	
Uncompahgre at Colona, Colorado	85	66	April-Sept	
Gunnison near Grand Junction, Colorado 16/	950	84	April-Sept	
Dolores at Dolores, Colorado	130	56	April-Sept	
Colorado near Cisco, Utah 16/	2,570	92	April-July	4,066
Green at Warren Bridge, Wyoming	510	158	April-Sept	
New Fork near Boulder, Wyoming	400	184	April-Sept	
Flaming Gorge Res., Utah, Net Inflow 17/	2,010	191	April-July	985
Yampa at Steamboat Springs, Colorado	365	140	April-Sept	
Yampa near Maybell, Colorado	1,200	141	April-Sept	
Little Snake near Dixon, Wyoming	440	170	April-Sept	
White near Meeker, Colorado	360	123	April-Sept	

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1921-70 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.

SELECTED STREAMFLOW FORECASTS May 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow In (1,000 A.F.)
	Flow In (1,000 A.F.)	Percent of Average		
UPPER COLORADO (continued)				
Duchesne near Tabiona, Utah 18/	89	105	May-July	
Whiterocks near Whiterocks, Utah	50	104	May-July	
Duchesne at Randlett, Utah	272	95	May-July	
Scofield Reservoir, Utah, Net Inflow 19/	29	107	May-July	29
Green at Green River, Utah 17/	4,100	159	April-July	2,970
Navajo Reservoir Inflow, New Mexico	310	50	April-July	446
Animas at Durango, Colorado	300	73	April-Sept	
San Juan near Bluff, Utah 20/	465	52	April-July	698
Colorado, Inflow to Lake Powell, Arizona 21/	7,740	119	April-July	8,220
LOWER COLORADO				
Virgin near Virgin, Utah	16	73	May-June	14
Little Colorado above Lyman, Arizona	1	11	May-June	6.9
Gila near Solomon, Arizona	26	22	Jan-May	55
Frisco at Clifton, Arizona	12	20	Jan-May	28
Salt at Intake, Arizona	67	24	Jan-May	162
Tonto above Roosevelt, Arizona	6.8	16	Jan-May	12.8
Verde above Horseshoe Dam, Arizona	67	39	Jan-May	111
GREAT BASIN				
Bear at Harer, Idaho	330	212	May-July	
Logan near Logan, Utah 22/	144	167	May-July	105
Ogden, Inflow to Pine View Res., Utah 23/	95	161	May-June	
Weber near Oakley, Utah	115	139	May-June	
Utah Lake, Utah, Net Inflow	178	132	May-July	
Big Cottonwood near Salt Lake City, Utah	36	120	May-July	
Beaver near Beaver, Utah	18	109	May-July	22
Sevier near Hatch, Utah	16.5	61	May-July	19
Sevier near Gunnison, Utah	37	169	May-July	
Humboldt at Palisades, Nevada	130	106	May-July	202
Truckee at Farad, California 26/	305	161	May-July	143
East Carson near Gardnerville, Nevada	165	115	May-July	161
West Walker near Coleville, California	130	104	May-July	122
Donner und Blitzen near Frenchglen, Oregon	48	120	May-July	41
Silvies near Burns, Oregon	39	100	May-July	42
Chewaucan near Paisley, Oregon	68	117	May-July	61
Deep above Adel, Oregon	55	131	May-July	47
UPPER COLUMBIA				
Columbia above Steamboat Rapids, B. C.	18,540	105	May-Sept	14,640
Kootenai at Libby, Montana	8,100	109	May-Sept	5,108
Kootenai at Leonia, Idaho	9,300	111	May-Sept	5,868
Blackfoot near Bonner, Montana	1,140	127	May-Sept	926
Flathead near Columbia Falls, Montana 27/	7,400	126	May-Sept	5,583
Flathead near Polson, Montana 27/	8,600	124	May-Sept	6,533
Clark Fork above Missoula, Montana	1,990	129	May-Sept	1,666
Bitterroot near Darby, Montana	670	133	May-Sept	607
Clark Fork at Plains, Montana 27/	14,000	126	May-Sept	11,283
Columbia at Birchbank, British Columbia 27/	45,750	105	May-Sept	32,981
Priest near Priest River, Idaho	800	111	May-July	
Pend Oreille below Box Canyon, Washington	16,900	122	May-Sept	13,191
Kettle near Laurier, Washington	2,030	122	May-Sept	1,028
Spokane at Post Falls, Idaho 28/	2,400	114	May-Sept	2,240
Columbia at Grand Coulee, Washington 27/	70,300	112	May-Sept	50,757
Okanogan near Tonasket, Washington	2,200	137	May-Sept	869
Methow near Pateros, Washington	1,300	134	May-Sept	593
Stehekin at Stehekin, Washington	1,120	135	May-Sept	
Chelan at Chelan, Washington 29/	1,580	138	May-Sept	850
Wenatchee at Peshastin, Washington	2,180	136	May-Sept	1,293

Forecasts in California provided by Department of Water Resources.
Average is for 1953–67 period except California. California is computed for 1921-70 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.

SELECTED STREAMFLOW FORECASTS May 1, 1971

STREAM AND STATION	FORECASTS THIS YEAR		Forecast Period	Last Year's Flow In (1,000 A.F.)
	Flow In (1,000 A.F.)	Percent of Average		
SNAKE				
Snake above Palisades Res., Wyoming 30/	4,080	160	April-Sept	
Grey's above Palisade, Wyoming	660	182	April-Sept	
Salt above Palisade, Wyoming	575	179	April-Sept	
Snake near Heise, Idaho 30/	5,300	155	May-Sept	3,850
Henry's Fork near Rexburg, Idaho 31/	1,400	127	May-Sept	
Teton near St. Anthony, Idaho	480	135	May-Sept	
Big Lost near Mackay, Idaho 32/	210	132	May-Sept	189
Blackfoot Reservoir Inflow, Idaho	160	157	April-Sept	
Portneuf at Topaz, Idaho	90	160	May-Sept	
Salmon Falls Creek nr San Jacinto, Idaho	85	184	May-Sept	
Big Wood, Inflow to Magic Res., Idaho 33/	320	174	May-Sept	
Bruneau near Hot Springs, Idaho	230	162	May-Sept	
Owyhee Res., Net Inflow, Oregon	225	141	May-July	233
Boise near Boise, Idaho 34/	1,850	150	May-Sept	1,470
Malheur near Drewsey, Oregon	39	118	May-July	
Payette near Horseshoe Bend, Idaho 35/	2,370	157	May-Sept	1,880
Weiser above Crane Creek, Idaho	410	154	May-Sept	
Snake at Weiser, Idaho	7,500	150	May-Sept	6,140
Powder near Baker, Oregon	54	128	May-July	
Imnaha at Imnaha, Idaho	302	118	May-Sept	272
Salmon at Whitebird, Idaho	8,100	131	May-Sept	7,030
Grande Ronde at LaGrande, Oregon	91	90	May-July	116
Clearwater at Spalding, Idaho	8,500	125	May-Sept	7,090
LOWER COLUMBIA				
Yakima at Cle Elum, Washington 36/	1,130	143	May-Sept	
Umatilla at Pendleton, Oregon	75	100	May-July	89
John Day, Middle Fork at Ritter, Oregon	82	117	May-July	84
Crooked near Post, Oregon	37	97	May-July	
Deschutes at Benham Falls, Oregon 37/	357	117	May-July	
Columbia at The Dalles, Oregon 27/	110,900	120	May-Sept	79,613
Hood near Tucker Bridge, Oregon 37/	260	137	May-July	
Willamette at Salem, Oregon 37/	3,750	135	May-July	
Lewis at Ariel, Washington 38/	1,400	146	May-Sept	595
Cowlitz at Castle Rock, Washington	2,860	135	May-Sept	1,577
NORTH PACIFIC COASTAL				
Dungeness near Sequim, Washington	169	110	May-Sept	
Umpqua, No., near Toketee Falls, Oregon	172	117	May-Sept	
Rogue at Raygold, Oregon	640	122	May-July	392
Klamath Lake, Net Inflow, Oregon	475	113	May-Sept	234
Trinity at Lewiston, California	780	126	April-July	434
CALIFORNIA CENTRAL VALLEY 39/				
Sacramento, Inflow to Shasta, California	1,950	110	April-July	1,364
Feather near Oroville, California	2,400	129	April-July	1,116
Yuba at Smartville, California	1,400	130	April-July	611
American, Inflow to Folsom Res., Calif.	1,600	122	April-July	816
Cosumnes at Michigan Bar, California	130	90	April-July	67
Mokelumne, Inflow to Pardee Res., Calif.	480	103	April-July	397
Stanislaus, Inflow to Melones Res., Calif.	610	85	April-July	590
Tuolumne, Inflow to Don Pedro Res., Calif.	900	75	April-July	1,045
Merced, Inflow to Exchequer Res., Calif.	410	67	April-July	465
San Joaquin, Inflow to Millerton Lake, Calif.	870	73	April-July	907
Kings, Inflow to Pine Flat Res., California	770	66	April-July	871
Kaweah, Inflow to Terminus Res., California	170	63	April-July	204
Tule, Inflow to Success Res., California	25	42	April-July	32
Kern, Inflow to Isabella Res., California	205	49	April-July	317
ALASKA				
Chena at Fairbanks, Alaska	770	174	May-June	174
Salcha near Salchaket, Alaska	980	167	May-June	275

Forecasts in California provided by Department of Water Resources.
Average is for 1953-67 period except California. California is computed for 1921-70 period.
Forecasts assume average Effective Climate Conditions from Date Through Snow Melt Season.

Explanatory Notes on Forecasts listed on Inside Back Cover.

has or will be realized. However, storage in Conchas Reservoir is 87 percent average, most of which is holdover from last year. Water conservation will be needed in this drainage.

RIO GRANDE BASIN

Practically all snow has disappeared in New Mexico and only limited amounts remain in southern Colorado. May 1st snow readings were among the lowest of record. This low snow indicates that flow of the Rio Grande River and its tributaries will be near 60 percent of average in Colorado and a little less than half of average in New Mexico. Flow of the Pecos River will be essentially half of average.

Unless summer rains are unusually plentiful, water supplies will be very deficient. This applies particularly to water users on natural flow rights and to those having limited storage rights. Storage in Elephant Butte Reservoir is 10 percent less than average, while El Vado holds two-thirds of its normal supply. Carryover storage for next year will be poor.

Present valley soil moisture conditions are reported as fair, except in the Taos area where conditions are good.

COLORADO BASIN

While the present snow cover in the upper Colorado River Basin is favorable as a whole, it continues to show marked variability within the Basin. Snow cover is heaviest on tributaries to the Green River in Wyoming and averages 185 percent of the usual amount. The snow decreases steadily to the south, with about 135 percent on the Yampa and White rivers and 122 percent on the upper Colorado. It decreases to 5 to 10 percent below average on the Gunnison, Duchesne, Price and San Rafael rivers. The snow continues to fall off to the south where it is essentially one-half of the normal on the Dolores and San Juan rivers in Colorado. The heavy snow cover in the main water producing areas more than offsets the effect of the drier areas so that snow cover for the entire upper Colorado is near 20 percent above the usual amount.

The generally favorable snowpack, combined with above average soil moisture and reservoir storage conditions indicate that water supplies will be satisfactory to excellent for most water users in the Upper Colorado Basin, as well as for those in the lower Colorado Basin who are served by the main stem of the river.

The principal exception to the satisfactory outlook will be along the Dolores and San Juan rivers where only about one-half normal streamflow is expected. Flow of the Uncompahgre and Animas rivers will be near two-thirds to three-fourths normal amounts. In the drier areas there will be a need to observe careful water conservation practices or crop production will be limited.

Forecasts for tributary streams in Wyoming range from 145 to 218 percent of average. Total inflow to Flaming Gorge Reservoir in Utah is expected to be 191 percent. The Little Snake near Dixon, Wyoming is forecast at 170 percent. In Colorado the Yampa should yield near 40 percent more than usual, while on the White and Upper Colorado it will be about 15 to 25 percent higher than average. Streams expected to produce within 10 to 15 percent of normal amounts include the Roaring Fork, Gunnison, Duchesne, Price and San Rafael rivers.

Unregulated flow of the principal tributaries is forecast as follows: Green at Green River, Utah 159 percent; Colorado near Cisco, Utah 92 percent and San Juan near Bluff, Utah 52 percent. Total inflow to Lake Powell, Arizona is forecast at 7,740,000 acre-feet for the April-July period, or 119 percent average. Storage in irrigation reservoirs is well above average.

April weather continued its dry pattern in the Lower Colorado Basin. All watersheds have prospects for below normal streamflow. Highest streamflow forecast is for the Virgin River in Utah (73 percent). Most of the snow melt runoff in Arizona has occurred. The total runoff for the forecast period January thru May will be near 15 to 25 percent on most streams. The Verde is a little better at 39 percent.

Due to present reservoir storage (84 percent average), the Salt River Project will have adequate water supplies. Present storage is sufficient for this year and next year, even if next year's runoff should be low. Water supplies will be very short along the Upper Gila River and on the San Carlos Project. Heavy ground water pumping will be required here.

GREAT BASIN

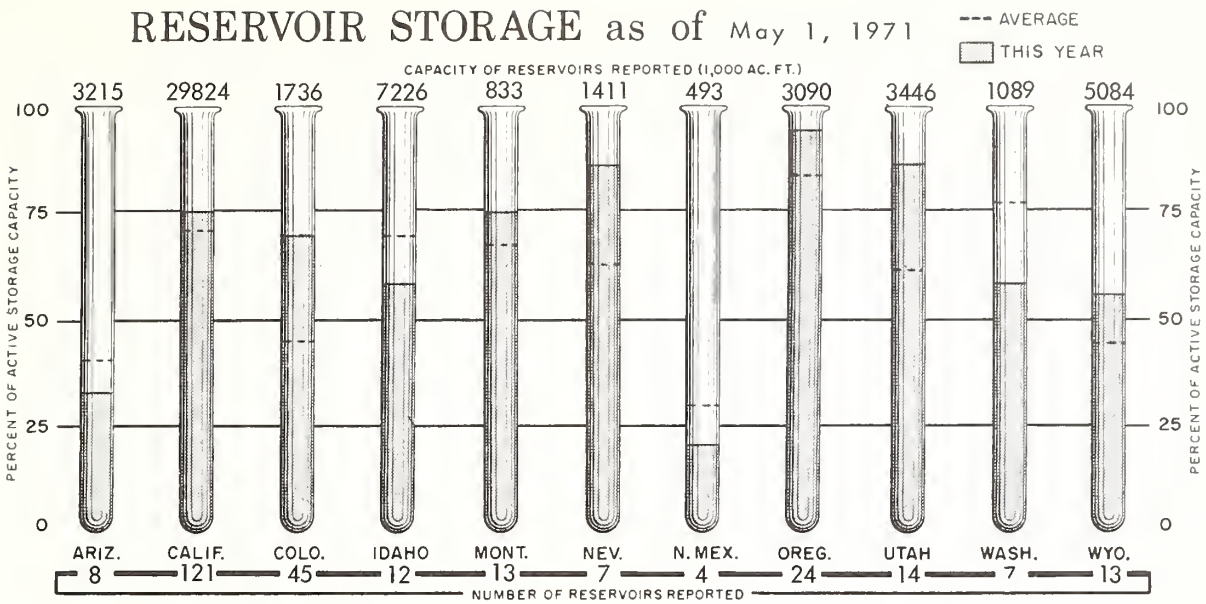
Considering the very favorable reservoir storage throughout the Great Basin, and average or considerably better streamflow prospects in all but a few smaller watersheds in the south, the summer's water supply should prove to

STORAGE IN LARGE RESERVOIRS May 1, 1971

BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE
UPPER MISSOURI			
Belle Fourche	185	159	143
Boysen	550	113	32
Buffalo Bill	373	111	90
Canyon Ferry	2,043	1,336	85
Fort Peck	19,140	16,660	149
Garrison	24,500	20,582	185
Hebgen	377	241	123
Keyhole	192	152	389
Lake Francis Case	5,816	4,087	105
Lake Sharp	1,900	1,813	108
Oahe	23,630	22,016	172
Tiber	1,347	481	73
Big Horn	1,356	777	106
PLATTE			
City of Denver (5)	507	470	126
Colo-Big Thompson (3)	718	588	144
Glendo	784	538	133
Pathfinder	1,016	891	203
Seminoe	1,010	385	128
ARKANSAS			
Conchas	273	130	87
John Martin	354	3	5
RIO GRANDE			
Elephant Butte	2,195	291	90
El Vado	195	21	68
UPPER COLORADO			
Blue Mesa	830	259	---
Flaming Gorge	3,749	1,986	---
Navajo	1,696	869	---
Powell	25,002	12,511	---
LOWER COLORADO			
Havasu	619	594	101
Mead	26,159	16,326	102
Mohave	1,810	1,706	99
Salt River Res. (4)	1,755	803	77
San Carlos	985	0	0
Verde River Res. (2)	318	180	133
GREAT BASIN			
Bear	1,421	1,202	126
Lahontan	286	236	106
Rye Patch	179	190	229
Sevier Bridge	236	231	244
Strawberry	274	210	159
Tahoe	732	597	129
Utah	884	884	142
Willard Bay	193	184	---

BASIN AND NAME OF RESERVOIR	CAPACITY (1,000 A.F.)	STORAGE (1,000 A.F.)	STORAGE PERCENT AVERAGE
UPPER COLUMBIA			
Chelan	676	193	92
Coeur d'Alene	225	281	98
Duncan	1,347	75	--
Flathead	1,791	1,083	116
Hungry Horse	3,428	1,647	83
Kootenay	673	580	127
Lower Arrow	3,083	193	36
Noxon Rapids	335	148	102
Pend Oreille	1,155	478	97
Roosevelt	5,232	744	30
Upper Arrow	4,061	394	36
LOWER COLUMBIA			
Cougar	155	26	--
Detroit	300	50	22
Hills Creek	200	51	31
Lookout Point	337	64	22
Yakima Res. (5)	1,066	619	75
SNAKE			
American Falls	1,700	1,699	102
Anderson Ranch	423	212	75
Arrowrock	287	241	105
Brownlee	980	53	--
Cascade	653	247	75
Jackson	847	501	114
Lucky Peak	278	33	22
Owyhee	715	698	131
Palisades	1,200	121	17
PACIFIC COASTAL			
Clair Engle	2,448	2,354	108
Clear Lake	440	419	158
Nacimiento	350	167	82
Ross	1,203	776	112
Upper Klamath	584	516	99
CALIFORNIA CENTRAL VALLEY			
Almanor	1,036	851	109
Berryessa	1,602	1,604	106
Folsom	1,010	819	116
Isabella	570	184	103
McClure	1,026	631	101
Millerton	521	410	117
New Bullards Bar	930	757	81
Oroville	3,484	3,265	108
Pine Flat	1,013	721	115
Shasta	4,500	4,493	108

Reservoir Storage Data Provided by Bureau of Reclamation , Corps of Engineers, Geological Survey. and water using organizations. Data from California and British Columbia provided by Department of Water Resources and Department of Lands, Forests and Water Resources, respectively.



be exceptionally good for all major irrigated areas.

The snowpack varies considerably. In extreme southern Utah and Nevada it ranges from nothing to half of average. In central Utah and along Nevada's Walker and Humboldt rivers, it is generally within 10 to 15 percent of average. Nevada's Carson River as well as streams in Lake County, Oregon have a 25 percent above average snow cover. The snow is much heavier (150 to 200 percent) on the Tahoe-Truckee drainage, the Surprise Valley area along the Nevada-California border, streams in Oregon's Harney Basin and along tributaries of the Bear River in Utah, Idaho and Wyoming.

Highest May-July runoff forecasts in Nevada are in the Tahoe-Truckee Basin, with the Truckee at Farad, California expected to yield 161 percent of usual amounts. Forecasts for the Walker-Carson drainages range from 98 percent on East Walker to 122 percent on West Carson. The Humboldt and its major tributaries will flow about 5 to 15 percent above average. Reservoirs in Nevada now hold 85 percent of their capacity and are at 136 percent of normal. With near to above average streamflow and excellent reservoir storage, prospects are for good to excellent carryover for the 1972 irrigation season.

Flow of the Bear River and its tributary streams in Utah, Idaho and Wyoming will generally be near 160 to 225 percent. High water may create some localized problems on these streams. Outlook for the South Fork of the Sevier River and streams near Cedar City became poorer during April. These streams will yield near one-half to two-thirds normal amounts. Reservoir storage on the Sevier River is exceptionally good, and combined with generally average to well above average streamflow prospects on the middle and lower Sevier, will provide excellent water supplies. Very favorable streamflow is anticipated in the Salt Lake-Provo area, as shown by Utah Lake where inflow should be a third above average.

Storage in 14 key reservoirs in Utah is 139 percent of the May 1st average.

COLUMBIA BASIN

The water supply outlook is excellent throughout the Columbia Basin. April storms left near or below average amounts of precipitation in most areas, although it was above normal in northern Idaho and on the upper Snake River. Cool weather delayed snowmelt. This maintained a serious flood potential from abnormally heavy snowpacks on many watersheds, particularly if an adverse sequence of temperatures and/or precipitation should develop during the main snowmelt period.

Except for the Owyhee River in Oregon where snow cover is near three-fourths normal, all other areas have a normal or much greater snowpack. The snow is near 150 to 200 percent along the Cascade Mountains, in east central Oregon, on the upper Snake River in Wyoming, and on

the upper Owyhee in Nevada.

The snowpack is near 10 to 40 percent above normal on most watersheds of the upper Columbia, Kootenay, Clark Fork, Spokane, Clearwater and Salmon rivers.

Flow of the Kootenay and Columbia rivers in British Columbia will be near 5 to 10 percent greater than usual. Heavy runoff (130 to 185 percent) is expected from streams in central and southern Idaho, in Wyoming, and along the Cascade Mountains of Washington and Oregon. From 10 to 30 percent above average flows are anticipated to come from the Flathead, Blackfoot, Clarks Fork and Bitterroot rivers in Montana, from Idaho's Spokane and Clearwater rivers, from streams in central and east central Oregon and from the Walla Walla and Kettle rivers in Washington. Oregon's Crooked, Umatilla and Grande Ronde rivers should produce from average to 10 percent less than average streamflow.

Water stored in reservoirs for irrigation continues near or above average. However, storage space reserved for flood control operations has been sharply drawn down to provide space for the expected high runoff to come as the snows melt.

ALASKA

Very heavy early season snowfall and cool weather during the month of April have combined to result in a considerably greater than normal May 1 snowpack. Low elevation snow in the interior of the state is usually reduced by melting in late April. This year virtually all of low snow remained on the watersheds and the higher elevation snowpack increased.

The outlook for interior Alaska streams is for very heavy flows during the months of May and June. This includes the Yukon, Tanana, Koyukuk, Kuskokwim, and Susitna rivers and their tributaries. May-June streamflow forecasts for the Chena River at Fairbanks and the Salcha River near Salchaket are 174 percent and 167 percent of normal, respectively.

Snow cover in the mountains of southeast Alaska is also greater than average. Low elevation snow in this region is also exceptionally deep.

Soils in the interior are somewhat drier than usual and will absorb some of the water from the melting snowpack.

CALIFORNIA

The California Department of Water Resources, coordinating agency for snow surveys and water supply forecasting in California, reports that below normal precipitation during April resulted in some deterioration in potential water supplies for this spring and summer in most areas of the State. While May 1 forecasts of April-July runoff from snowmelt streams are near average statewide, the mal-distribution of this year's water crop is apparent. North of the Mokelumne River, spring runoff is forecasted to be normal and above. Southern Sierra tributaries to the San Joaquin Valley are forecasted to produce only half of their 50-year average runoff for this period. As in the Central and South Coastal areas much of the shortages in this area will be met by pumping ground water. With storage in the State's major reservoirs normal or above in all areas, no critical water deficiencies are anticipated.

Precipitation during April in California reflected an irregular pattern but was generally well below normal, averaging 65 percent of normal for the State. Only the North Coastal area experienced normal April precipitation. The first of the six storms experienced over the State during the month brought light precipitation only as far south as Yosemite Valley on the 7th and ended a widespread warm temperature regime. On the 8th, a new front stalled over Crescent City which, after developing a new wave, pushed inland on the 10th, producing light precipitation north of the Mokelumne River Basin. The storm of the 14th was generally restricted to the coastal areas and Central Valley, but deposited the first rain in the Imperial Valley since the middle of February. This was followed by a cold storm on the 17th and 18th which, while moderate, was the greatest producing statewide storm of the month and dropped the snow line to around the 2,000 foot elevation. Freezing temperatures were experienced in coastal valleys during the storm of the 20th and 21st which brought light precipitation as far south as the Tehachapi Mountains. During the weekend of the 24th and 25th, light precipitation occurred, generally on the eastern slopes of the Sierra and the north coastal areas. Seasonal precipitation for the period October through April averaged 90 percent of normal for the State.

May 1 measurements of key snow courses indicated the water content of the State's

snowpack was 130 percent of the 40-year average for this date. Usually, the snowmelt during April reduces the snowpack from 25 to 30 percent of the April 1 amount. Although precipitation was generally below normal, the cold storms retarded the depletion of the snowpack in some watersheds to as low as 5 percent of the April 1 water content. Only in San Joaquin Valley watersheds did snowpack water content depletion exceed that normally expected.

Forecasts of April-July runoff for Central Valley snowmelt streams averaged 97 percent of normal as of May 1. Although down slightly from that reported last month, all major tributaries to the Sacramento Valley are expected to produce normal or above spring runoff. In the San Joaquin Valley, the water supply outlook has again been reduced as the area continues to experience below normal precipitation. Streamflow forecasts of snowmelt tributaries to the San Joaquin Valley range from 85 to 42 percent of normal, with an overall average of 70 percent of normal.

Runoff of California streams during April was generally below normal and below expected for all snowmelt streams. Some of this deficiency of runoff from the snowmelt streams will be reflected in the runoff later in the season but a large part, as the revised forecasts indicate, is now lost. April runoff from Central Valley streams decreased generally from north to south, varying from 118 percent of normal for the Feather River Basin to 46 percent of normal for the Tule River Basin. With the exception of the North Coastal area, at 125 percent of normal, the runoff from all coastal streams during April was below 50 percent of normal. Runoff for the period October through April was 115 percent of normal for the Central Valley and 135 percent of normal for the State.

As of May 1, 121 of the major reservoirs in California were storing 22,349,000 acre-feet. This storage is 71 percent of their aggregate capacity and 105 percent of their 10-year average. From that reported one year ago, there has been a net decrease of about 33,000 acre-feet.

EXPLANATION of STREAMFLOW FORECASTS

All flows are observed flows except as adjusted for: 1/ Change in storage in Hebgen Lake. 2/ Change in storage in Canyon Ferry and Tiber reservoirs. 3/ Change in storage in Gibson Reservoir and measured diversions. 4/ Change in storage in Two Medicine, Four Horns and Lake Francis reservoirs. 5/ Change in storage in Boysen and Buffalo Bill reservoirs.

6/ Change in storage in Boysen, Buffalo Bill, Canyon Ferry, Tiber, and Fort Peck reservoirs. 7/ Plus diversions to Cache la Poudre. 8/ Minus diversions from North Platte, Laramie, and Colorado rivers plus measured diversions above station. 9/ Change in storage in Twin Lakes and Sugar Loaf reservoirs minus diversions from Colorado River. 10/ Change in storage in Rio Grande, Santa Maria, and Continental reservoirs.

11/ Change in storage in Platoro Reservoir. 12/ Change in storage in El Vado Reservoir. 13/ Change in storage in Granby Reservoir plus diversions to Cache la Poudre and through Adams Tunnel. 14/ Changes as indicated in (13) plus Moffat Tunnel diversion. 15/ Plus diversions to Arkansas River.

16/ Change in storage in Blue Mesa reservoir. 17/ Change in storage in Flaming Gorge, Fontenelle and Big Sandy reservoirs. 18/ Plus diversion through Duchesne Tunnel. 19/ Change in storage in Scofield Reservoir. 20/ Change in storage in Navaho Reservoir.

2 21/ (Lee's Ferry) Change in storage in Flaming Gorge, Navajo, Lake Powell and Big Sandy reservoirs. 22/ Plus Utah Power and Light Company tailrace and and Logan, Hyde Park, and Smithfield canals. 23/ (Inflow record computed by U. S. Bureau of Reclamation.) 24/ Plus diversion by Weber-Provo Canal and change in storage in Wanship Reservoir. 25/ Change in storage in Deer Creek Reservoir, minus diversions through Duchesne Tunnel and Weber-Provo Canal, plus diversion through Salt Lake City Aqueduct.

26/ Change of storage in Lake Tahoe and Boca Reservoir. (Forecast by Truckee Basin Committee) 27/ Change in storage in any of these reservoirs above the station: Kootenai Lake, Hungry Horse, Flathead Lake, Pend Oreille Lake, F. D. Roosevelt Lake, Lake Chelan, Coeur d'Alene Lake, Brownlee and Noxon; and pumpage at Roosevelt Lake. 28/ Changes in storage in Coeur d'Alene Lake and diversions by Spokane Valley Farms Company and Rathdrum Prairie canals. 29/ Change in storage in Lake Chelan. 30/ Changes in storage for Jackson Lake and Palisades Reservoir above stations. 30/

31/ Change in storage in Henry's Lake, Island Park and Grassy Lake reservoirs and diversions between Ashton and Rexburg. 32/ Change in storage in Mackay Reservoir, and diversion in Sharp Ditch. 33/ (Combined flow Big Wood River nr. Bellevue and Camas Creek nr. Blaine.) 34/ Change in storage in Arrowrock, Anderson Ranch, and Lucky Peak. 35/ Change in storage in Cascade and Deadwood reservoirs. 36/ Change in storage in Keechelus, Kachess, and Cle Elum reservoirs plus diversion by Kittitas Canal. 37/ (Corrected to natural flow). 38/ Change in storage in Merwin, Yale, and Swift reservoirs. 39/ (Corrected for upstream impairments).

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